

REMARKS/ARGUMENTS

This amendment is responsive to the Office Action mailed September 12, 2008 rejecting claims 1-3, 6 and 10-19 and withdrawing claims 5 and 7. The Examiner rejected claims 3 and 13 under 35 U.S.C. 112 second paragraph, claims 1, 10-11, 15 and 17-18 under 35 U.S.C. 102(b) as being anticipated by Shindo et al. (U.S. Pat. No. 5,048,179), claims 2, 6, 12-14, 16 and 19 under 35 U.S.C. 103(a) as being upatentable over Shindo et al. (U.S. Pat. No. 5,048,179) in view of Nakamura (U.S. Pat. Appl. No. 2007/0166886), and claim 4 under 35 U.S.C. 103(a) as being upatentable over Shindo et al. (U.S. Pat. No. 5,048,179) in view of Nakamura (U.S. Pat. Appl. No. 2007/0166886) and Mowatt et al. (US 5,306,670). With this amendment, Applicants amended claim 3 to overcome the indefiniteness rejection, cancelled claims 1-2, 4, 6, 8-10 and 13-15, amended the claims, including claims 5 and 7, such that all the dependent claims now depend from claims 3 and 16, and added claims 20-26 which also depend from claims 3 and 16. Applicants submit that after entry of this amendment claims 3, 5, 7, 11-12, and 16-26 are in condition for allowance and respectfully request such action.

Claim 3

The Examiner rejected claim 3 under 35 U.S.C. 112 second paragraph stating that “It is unclear, when components are embedded in at least two sheets, which of these sheets are subsequently attached on top of each other.” The Examiner also stated that it is necessary to distinguish “between the two recesses and the two conductive layers.”

Applicants respectfully disagree. Because the electronic module made by the method of claim 3 only has one sheet it cannot be unclear “which of these sheets are subsequently attached on top of each other.” By placing two components inside a sheet facing opposite surfaces of the sheet, the present invention enables, in a single sheet, connection of both components to conductive layers on both sides of the sheet. Claim 3 as previously presented distinguished the two conductive layers which the Examiner found indefinite as “conductive layer on the first surface” and “conductive layer on the second surface.” Applicants replaced “conductive layer on the first surface” with “first conductive layer” and “conductive layer on the second surface” with “second conductive layer” and made additional clarifying amendments to speed prosecution.

Claim 16

The Examiner objected to claim 16 due to informalities which Applicants corrected by adding the term “first” before “component” according to the Examiner’s recommendation.

Claims 1, 10-11, 15 and 17-18

Claims 1, 10-11, 15 and 17-18 stand rejected under 35 U.S.C. 102(b) as being anticipated by Shindo et al. (U.S. Pat. No. 5,048,179). The rejection of claims 1, 10 and 15 is mooted by their cancellation. Claim 11 depended from claim 1 and claims 17-18 depended from claim 15. Claim 11 was amended to depend from claim 3 and claims 17-18 were amended to depend from claim 16. Because Shindo does not disclose a sheet with two components facing opposite surface of the sheet, as admitted by the Examiner, claims 1 and 16 are not anticipated by Shindo and therefore the anticipation rejection of claims 11 and 17-18 is also moot.

Claims 2, 6, 12-14, 16 and 19

Claims 2, 6, 12-14, 16 and 19 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Shindo et al. (U.S. Pat. No. 5,048,179) in view of Nakamura (incorrectly cited as U.S. Pat. Appl. No. 2007/0166886). The rejection of claims 2, 6 and 13-14 is mooted by their cancellation.

Claim 12 depended from claim 1 and was amended to depend from claim 3. Since the amendment of claim 3 puts it in condition for allowance, the rejection of claim 12 is moot. Nonetheless, Applicants will explain the differences in the methods of making modules according to claim 12 and Nakamura to speed prosecution. Nakamura teaches encapsulating components mounted on a sheet rather than placing components in recesses in said sheet. First, wiring patterns 13 are made on both sides of frame resin layer 11. (Nakamura, paragraph 46.) Then, components are mounted on the wiring patterns 13. (Nakamura, paragraph 47.) No recesses are formed in frame resin layer 11 as is required by claim 12. In the next step, “a press working on heating and pressuring is formed after placing resin sheets in a B-stage state on both sides of the frame resin layer 11. . . . By performing this process, the resin sheet is completely cured and the resin layers 12 including buried electronic components 15 therein are formed on boths sides of the incomplete multilayer wiring board 1-B.” (Nakamura, paragraph 49.) Thus, Nakamura requires a sheet and two insulating layers to bury two components facing both sides of a sheet while claim 3 only requires one sheet and one insulating layer. Finally, at page 7 third

paragraph, the Examiner argues that Nakamura teaches forming a recess because “component 15 creates a recess in layer 12.” Nakamura’s teaching is in contrast to claim 12 which requires forming a recess and placing a component in the recess. Claim 12 necessarily requires that the step of forming a recess take place before the placement step, otherwise there is no recess in which to perform the placement step, whereas Nakamura requires placement of the component which placement is then followed by encapsulation.

Claim 19 depended from claim 15 and was amended to depend from claim 16. Claims 16 and 19 are not unpatentable under 35 U.S.C. 103(a). The Examiner asserts that Shindo teaches a sheet with an insulating-material layer between first and second surfaces of the sheet and a first component in a first recess in the insulating-material layer and electrically connected to a first conductive pattern layer 58 on the first surface of the sheet. The Examiner also admits that Shindo fails to teach a second component in a second recess in the insulating-material layer and electrically connected to a second conductive pattern layer on the second surface of the sheet. Then, the Examiner asserts, incorrectly, that Nakamura teaches what Shinto fails to teach, e.g. Fig. 3 and paragraph 40 in Nakamura. (Office Action, page 9 first paragraph, lines 4-10.) The Examiner states that Nakamura teaches “a second conductive pattern layer 13 on the second surface of the sheet 11, a second component 15 placed in the insulating-material layer and facing the second conductive pattern layer, a second electrically insulating adhesive 12 attaching the second component 15 to the second conductive pattern layer 13 on the second surface of the sheet 11 etc.” (Office Action, page 9 second paragraph.)

The Examiner’s argument omits essential elements of claim 16. In contrast to Nakamura, claim 16 requires a sheet with an insulating-material layer, first and second recesses extending through the insulating-material layer, first and second components placed in the first and second recesses, respectively, first and second conductive layers on first and second surfaces of the sheet, respectively, the first component attached to the first conductive layer and the second component attached to the second conductive layer. When read in combination, claim 16 necessarily requires that:

- 1) the first and second components connected to the first and second conductive patterns are inside a single sheet, because the recesses are in the sheet and the components are in the recesses;
- 2) the first and second conductive patterns are on the first and second surfaces of the sheet; therefore

- 3) the first and second components are between the first and second conductive patterns to which they are connected

The combined references do not disclose placing components in recesses in the same insulating-layer facing both the first and second surface of the insulating layer.

The Examiner's own characterization is inconsistent with his conclusion. As the Examiner stated, Nakamura's component 15 is placed in the insulating-material layer facing the second conductive pattern on the second surface of sheet 11. However, the insulating-material layer is not between the first and second surfaces of sheet 11. As seen in Fig. 3, components 15 and 16 are "buried" in resin layer 12 (see Nakamura, paragraphs 39, and 40 at line 5), and there are no components between the surfaces of sheet 11 as is required by claim 16.

Claim 4

Claim 4 stands rejected under 35 U.S.C. 103(a) as being unpatentable over Shindo et al. (U.S. Pat. No. 5,048,179) in view of Nakamura (U.S. Pat. Appl. No. 2007/0166886) and Mowatt et al. (US 5,306,670). The rejection is mooted by the cancellation of claim 4. However, because of the similarities between 4 and claim 3, Applicants proceed to explain why claim 4 is not obvious.

The Examiner admits that Shindo and Nakamura do not teach all the elements of claim 4 and recites features taught by Mowatt without ever suggesting that the combination of the three references teach all of the elements of claim 4 or articulating reasoning with rational underpinning for the legal conclusion of obviousness. The Examiner asserts that Nakamura teaches a sheet 12 which is surfaced with a conductive layer 13 on both surfaces and admits that the combination of Shindo and Nakamura fails to teach manufacturing at least one second recess through the first surface and the insulating-material layer as far as the second conductive layer, placing a second component in the second recess facing the second surface, and attaching the second component to the second conductive layer. (Office action, page 10 last paragraph.)

The Examiner's characterization of Mowatt fails to describe the elements missing from the combination of Shindo and Nakamura because it is inaccurate and, more importantly, because Mowatt does not show them. To wit, Mowatt does not show two recesses having two components connected to two conductive patterns on opposite surfaces of a sheet which includes an insulating layer. First, the Examiner correctly points out that Mowatt describes a component

(heatsink). The Examiner does not point out, because Mowatt does not show, two components in a sheet. Second, the Examiner does not point out, because Mowatt does not show, even one recess extending through a surface of the sheet and the insulating-material layer. Finally, the Examiner incorrectly states that the heatsink is attached to conductive layer 18.

Mowatt merely discloses the same arrangement of a component attached to a conductive layer taught by Nakamura. As shown in the first page of Mowatt and described in the abstract, and further described in Figure 7, Mowatt discloses conductive layers 18, 20 disposed on opposite sides of lower laminate layer 16. Heatsink 156 is attached to conductive layer 20 externally and not between the surfaces of laminate layer 16. In fact, laminate layer 16 has through holes that pass through both conductive layers 18, 20 to allow I/O connector 152 therethrough, but holes are not recesses. No recesses extend through only one conductive layer and laminate layer 16, and no components are located in laminate layer 16.

Furthermore, the Examiner's *prima facie* case fails to articulate reasons for combining the references and secondary considerations indicate that the invention is not obvious. "[R]ejections on obviousness cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." *KSR Int'l Co. v. Teleflex Inc.*, 127 S.Ct. 1727, 1741 (2007); see also MPEP § 2141 (2007).

The invention addresses a long-felt need not previously solved. As early as 1987 and 1993, Shindo and Mowatt conceived novel ways of increasing the number of components in wiring boards. Shindo was published on September 17, 1991 and Mowatt on April 26, 1994. On February 25, 2002, eight years after Mowatt's publication, Nakamura filed his patent application on another stacking method for increasing the number of components on a board. The fact that Nakamura nor any other reference discloses the present invention, even when the need to increase components on wiring boards has long been felt, suggests the invention is not obvious.

Claims 20-26

New claims 20-26 depend from claims 3 and 16 and are allowable for the same reasons given above. Additionally, claims 24 and 26, wherein adhesive is positioned between a component and a conductive layer before positioning the component in a recess is not taught by the cited references and is not inherent in the disclosed methods. For instance, Nakamura

encapsulates components after they are connected to conductive layers. Shindo positions the component in a recess that does not extend through the insulating layer. Mowatt does not include a recess in the insulating layer. Support for claims 20, 23-26 can be found at least at paragraphs 28-29 and 45-46. Support for claim 21 can be found at least at paragraphs 65 and 79. Support for claim 22 can be found at least at paragraphs 56-58.

Applicants believe that a one month extension of time fee and no other fee is required for the submission of this Amendment. Please charge the one month extension of time fee and, if Applicant's belief is in error, any other fees which may be due to Baker & Daniels' Deposit Account No. 02-0390. Any such fees charged to Deposit Account No. 02-0390 should not include the payment of issue fees for this application.

Respectfully submitted,

/Marcelo S. Copat/

Marcelo S. Copat, Reg. No. 51,580
Attorney for Applicants

Baker & Daniels LLP
300 North Meridian Street, Suite 2700
Indianapolis, Indiana 46204
Telephone: (317) 237-1367
Facsimile: (317) 237-1000
e-mail: Marcelo.Copat@bakerd.com